Claims

1. A method for controlling distortion of a material during a weld process, including the steps of:

modeling the weld process of the material;

determining distortions produced by the weld process in the model;

determining a plurality of simulated induced distortions in the model to offset the produced distortions;

generating a plurality of actual induced distortions in the material as a function of the simulated induced distortions; and

performing the weld process on the material.

2. A method, as set forth in claim 1, wherein determining a plurality of simulated induced distortions includes the step of determining at least one of a plurality of pre-straining and pre-cambering distortions, and wherein generating a plurality of actual induced distortions includes the step of generating the at least one of the plurality of pre-straining and pre-cambering distortions.

3. A method, as set forth in claim 2, wherein generating a plurality of pre-straining distortions includes the step of bending the material into a permanent distorted shape.

4. A method, as set forth in claim 2, wherein generating a plurality of pre-cambering distortions includes the step of bending the material into a temporary distorted shape.

5. A method, as set forth in claim 4, wherein bending the material into a temporary distorted shape includes the step of clamping the material into a pre-cambering fixture adapted to hold the material in the temporary distorted shape.

6. A method, as set forth in claim 5, further including the steps of:

modeling the locations of a plurality of clamps for clamping the material into the pre-cambering fixture in response to the step of determining a plurality of simulated pre-cambering distortions;

modeling the steps of welding the material by at least one simulated robotic welding arm;

modifying the pre-cambering fixture to prevent interference to the at least one simulated robotic welding arm from performing the desired welding;

installing a plurality of actual clamps at the desired locations to clamp the material into the pre-cambering fixture; and

performing the welding process by at least one actual robotic welding arm.

7. A method, as set forth in claim 6, wherein modifying the pre-cambering fixture includes the step of moving the location of at least one simulated clamp.

8. A method for controlling distortion of a material during a welding process, including the steps of:

modeling the weld process of the material;

determining distortions produced by the weld process in the model;

determining a plurality of simulated pre-straining distortions in the model to offset the produced distortions;

generating a plurality of actual pre-straining distortions in the material as a function of the simulated pre-straining distortions; and

performing the weld process on the material.

9. A method, as set forth in claim 8, wherein generating a plurality of pre-straining distortions includes the step of bending the material into a permanent distorted shape.

10. A method for controlling distortion of a material during a weld process, including the steps of:

modeling the weld process of the material;

determining distortions produced by the weld process in the model;

determining a plurality of simulated pre-

cambering distortions in the model to offset the produced distortions;

generating a plurality of actual pre-cambering distortions in the material as a function of the simulated pre-cambering distortions; and

performing the weld process on the material.

11. A method, as set forth in claim 10, wherein generating a plurality of pre-cambering distortions includes the step of bending the material into a temporary distorted shape.

12. A method, as set forth in claim 11, wherein bending the material into a temporary distorted shape includes the step of clamping the material into a pre-cambering fixture adapted to hold the material in the temporary distorted shape.

13. A method, as set forth in claim 12, further including the steps of:

modeling the locations of a plurality of clamps for clamping the material into the pre-cambering fixture in response to the step of determining a plurality of simulated pre-cambering distortions;

modeling the steps of welding the material by at least one simulated robotic welding arm;

moving the location of any simulated clamps which prevent the at least one simulated robotic welding arm from performing the desired welding;

installing a plurality of actual clamps at the desired locations to clamp the material into the pre-cambering fixture; and

performing the welding process by at least one actual robotic welding arm.

14. A method for controlling distortion of a material during a weld process, including the steps of:

modeling the weld process of the material;

determining distortions produced by the weld process in the model;

determining a plurality of simulated pre-cambering distortions in the model to offset the produced distortions;

modeling the locations of a plurality of clamps for clamping the material into a pre-cambering fixture;

modeling the steps of welding the material by at least one simulated robotic welding arm;

moving the location of any simulated clamps which prevent the at least one simulated robotic welding arm from performing the desired welding;

installing a plurality of actual clamps at the desired locations to clamp the material into the pre-cambering fixture and responsively generate a plurality of actual pre-cambering distortions in the material; and

performing the welding process by at least one actual robotic welding arm.